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मानक

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“Step Out From the Old to the New”

IS 10617-2 (1983): Hermetic Compressors, Part 2: Medium Temperature Application group [MED 3: Refrigeration and Air Conditioning]



“ज्ञान से एक नये भारत का निर्माण”

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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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REAFFIRMED 2007

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IS : 10617 (Part 2) - 1983
(Reaffirmed 1996)

REAFFIRMED

Indian Standard

- ... 2007

SPECIFICATION FOR HERMETIC COMPRESSORS

PART 2 MEDIUM TEMPERATURE APPLICATION GROUP

1. Scope — This standard applies to hermetically sealed refrigeration compressors operating on vapour compression cycle, suitable for medium temperature applications.

2. Terminology

2.1 Refrigeration Compressor — A machine consisting of an electrically driven refrigerant pump housed in a container which is welded or brazed together to form a gas-tight shell. The machine cannot be taken apart without cutting open the container housing and has no access to internal moving parts. The electrical windings are exposed to both the refrigerant and the compressor lubricating oil.

2.2 Refrigeration Capacity — The refrigerating effect in kcal units per hour. It is calculated from the product of mass flow rate and the difference between the total enthalpy of the refrigerant vapour entering the compressor suction at a specified temperature and pressure and the total enthalpy of the condensed refrigerant liquid at a specified temperature and pressure measured just before the expansion valve as described in 4.1.

3. Classification of Compressors

3.1 The compressor shall be classified as a medium temperature application compressor, if the evaporating temperature range of the compressor is between -20° to $+10^{\circ}\text{C}$.

3.1.1 The precise limits of the evaporating temperature range shall be according to manufacturer's specifications.

4. Rating and Test Conditions

4.1 Compressor Capacity Rating Test — The capacity of the hermetic compressor shall be evaluated at the specified test conditions, as given in Table 1.

TABLE 1 SPECIFIED TEST CONDITIONS*

SI No.	Item	Unit	Conditions
1.	Evaporating temperature	$^{\circ}\text{C}$	7.2 ± 0.5
2.	Condensing temperature	$^{\circ}\text{C}$	55 ± 1
3.	Ambient temperature	$^{\circ}\text{C}$	35 ± 1
4.	Compressor suction gas temperature	$^{\circ}\text{C}$	35 ± 1
5.	Temperature of sub-cooled liquid	$^{\circ}\text{C}$	46 ± 1
6.	External cooling of compressor	—	Natural convection or any other system specified by the manufacturer
7.	Voltage	Volts	Rated voltage $\pm 2\%$
8.	Frequency	Cycles	Rated frequency $\pm 2\%$

Note 1 — For any other condition of liquid sub-cooling, encountered in actual test, test results shall be corrected by calculation, back to the rated figure.

Note 2 — The manufacturer shall specify the maximum and minimum operating pressure and temperature conditions for the safe operation of the compressor.

*The above test conditions are applicable to hermetic compressors operating on Refrigerants R-12 and R-22 only.

Adopted 21 June 1983

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NEW DELHI 110002

IS : 10617 (Part 2) - 1983

5. Testing — The compressor tests shall be divided into two categories:

- a) *Type Tests* — To be performed once a year or at a frequency agreed between the manufacturer and the supplier; and
- b) *Routine Tests*.

5.1 Type Tests

5.1.1 Refrigeration capacity test — The determination of refrigeration capacity of hermetic compressors may be carried out by any of the methods and the test appliances given in IS : 5111-1969 'Code of practice and measurement procedures for testing refrigerant compressors', depending on the test equipment available at manufacturer's works. The observed capacity values when measured under stabilised conditions, shall be within ± 5 percent of the declared values.

Note — Reference to IS : 5111-1969 has been made only for the purposes of selection of test method on procedure or equipment and not for any test conditions mentioned there.

5.1.2 Startability test — The hermetic compressors have following types of starting methods:

Single Phase

- RSIR — Resistance start induction run
- CSIR — Capacitor start induction run
- PSC — Permanent split capacitor
- CSR — Capacitor start and run

Three Phase — Star/delta

For any of the above category, it should be able to take start at the lowest voltage range and come up to the stabilised running conditions. The testing conditions such as pressure differential, equalised pressure, ambient temperature, etc, shall be according to the manufacturer's specifications.

5.1.3 Locked rotor test with accessories — The compressor along with its specified electrical accessories shall be subjected to blocked piston locked rotor test at rated voltage and at controlled ambient temperature not exceeding 35°C until stabilisation in winding temperature is achieved.

The peak and stabilised winding temperatures under this test shall not exceed the limits as specified by the manufacturers. The compressor holding refrigerant pressure shall be as specified by the compressor manufacturer.

5.1.4 High voltage test — The compressor shall be able to withstand 1.5 kV for 1 minute without breakdown. This test shall not be repeated on the same compressor.

5.1.5 Insulation resistance test — The insulation resistance between all electric circuits included in the compressor, and earthed metal parts, when measured at normal room temperatures at the manufacturer's works with a voltage of 500 V dc, shall be not less than 1 MΩ. This test shall be conducted after high voltage test.

5.1.6 Pneumatic test of shell — The shells shall be tested pneumatically (dry air/nitrogen) at a test pressure of 7 bar (7 kgf/cm²) and shall not show any leakage.

5.1.7 Bursting test — Representative samples of the shell shall be subjected to an internal hydrostatic pressure till it bursts. The nominal hoop stress corresponding to the pressure at which destruction occurs shall be calculated from the formula :

$$f_b = \frac{P_b D_i}{20 t'}$$

where

f_b = nominal hoop stress at which destruction occurs, MPa

P_b = internal hydrostatic pressure at which shell bursts, bar;

D_i = nominal original internal diameter of the shell, mm; and

t' = minimum agreed finished thickness, as specified on the drawing (including corrosion allowance, if any).

**AMENDMENT NO. 1 JANUARY 1997
TO
IS 10617 (PART 2) : 1983 SPECIFICATION FOR
HERMETIC COMPRESSORS**

PART 2 MEDIUM TEMPERATURE APPLICATION GROUP

(*Page 1, foot-note with '*' mark*) — Substitute the following for the existing foot-note:

'*The above test conditions are applicable to hermetic compressors operating on Refrigerants R-12, R-22 and alternate ozone friendly refrigerants.'

(HMD 03)

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 2 SEPTEMBER 2000
TO
IS 10617 (PART 2) : 1983 SPECIFICATION FOR
HERMETIC COMPRESSORS**

PART 2 MEDIUM TEMPERATURE APPLICATION GROUP

(Page 2, clause 5.1.4) — Substitute the following for the existing clause:

'5.1.4 High voltage test — The compressor shall be able to withstand 1.5 kV for 1 minute for single phase compressors and 2 kV for 1 minute for three phase compressors. This test shall not be repeated on the same compressor.'

[Page 3, clause 5.2(a)] — Substitute the following for the existing:

'a) High voltage test at 1.5 kV for 1 second for single phase compressors and 2 kV for 1 second for three phase compressors.'

(MED 3)

5.1.7.1 The value of f_b shall be not less than 0.95 of the minimum specified tensile strength of the material of the cylinder.

5.1.7.2 The shell shall burst without fragmentation.

5.1.8 Holding charge — All compressors shall have a nominal holding charge of dry air/nitrogen having a dew point not more than -40°C .

5.2 Routine Tests — Routine tests shall consist of the following tests as per the mutual agreement between a supplier and a buyer:

- a) High voltage test at 1.5 kV for 1 second,
- b) Insulation test at 500 V dc; the insulation resistance shall be not less than 1 M Ω ,
- c) Shell leakage test, at a pressure corresponding to 1.1 times P_{max} , where P_{max} is the maximum operating pressure inside the shells, as specified by the manufacturer.

6. Specifications

6.1 Compressor specification literature may include the following for facilitating selection of compressor by buyer :

- a) Type — Hermetic,
- b) Displacement per revolution;
- c) Refrigerant type;
- d) Application group/range of evaporating temperature;
- e) Refrigeration capacity at rating conditions in kcal/h,
- f) Electrical characteristics, such as nominal voltage, voltage range, phases, frequency and nominal input power;
- g) Method of cooling;
- h) Starting methods;
- j) Wiring diagram with details of start relay/capacitor, run capacitors, overload protectors, etc;
- k) External physical dimensions and pipe connections;
- m) Compressor weight; and
- n) Quantity of oil and its grade.

7. Marking

7.1 The name plate marking shall include the following compulsory markings :

- a) Model/type,
- b) Nominal voltage/frequency,
- c) Phases,
- d) Refrigerant,
- e) Serial number, and
- f) Name of the manufacturer.

7.2 ISI Certification Marking — Details available with the Indian Standards Institution.

8. Painting and Packing — Painting (colour, type, etc) and mode of packing shall be according to the manufacturer's specifications.

EXPLANATORY NOTE

This standard has been prepared to assist manufacturers and users as a common guide for performance evaluation and rating of hermetically sealed refrigeration compressors. For the purpose of easy reference, the standard is being issued in different parts as under :

Part 1 High temperature application group

Part 2 Medium temperature application group

Part 3 Low temperature application group

In the preparation of this standard, assistance has been derived from the following standards:

ISO 917-1974 Testing of refrigerant compressors, International Organization for Standardization.

DIN 8973-75 Standard rating of single stage hermetic and semihermetic motor compressors for refrigeration system, DIN Deutsches Institut für Normung, West Germany.

BS 3122 : 1979 (Part II) Refrigerant compressors — Method for presentation of performance data. British Standards Institution, UK.

ARI-520-1978 Standard for positive displacement refrigerant compressors, compressor units and condensing units, Air Conditioning and Refrigeration Institute, USA.

UL 984 Standard for safety — Sealed (Hermetic type) motor compressors, Underwriters Laboratories, USA.

ASHRAE Standard 23-78 Methods of testing for rating positive displacement refrigerant compressors, American Society of Heating, Refrigerating and Air Conditioning Engineers, USA.

CECOMAF Standard single stage hermetic and accessible hermetic motor compressors — Standard capacity rating and data covering this rating. Construction de Material Frigorique, France (European Committee of Manufacturers of Refrigeration Equipment).